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EDITORIAL

TRICHOMONIASIS IN CATTLE

On former occasions we have drawn attention in these columns to the part played by the protozoan parasite, *Trichomonas fœtus,* in the causation of infertility in cattle. While it is within fairly recent times that attention in this country has been focused on the occurrence of trichomoniasis it seems apparent that the disease may have been present for many years and passed unrecognised. With the more detailed information in our possession now, and especially with a better acquaintance of methods of diagnosis, more outbreaks are being brought to light. In this issue of the *Veterinary Journal* we publish an important article on the subject, in which is given much information which should prove of real value to veterinary practitioners in whose practices trichomoniasis is found. The article is compiled by one who has had much experience from both the field and laboratory angles and many of his opinions are results of close observation and experimentation. It may be that some observers are still of the opinion that trichomonads are not the cause of infertility but they are merely commensuals either playing no part in infertility or acting only as exciting agents, paving the way for the introduction of pathogenic organisms which are the true cause of the alteration in the genital tissues. It would seem apparent from the results of experiments that the *Trichomonas fœtus* in many cases is the sole responsible pathogen and that its control is followed by a return to normal breeding capacity of the infected animal. At the same time, there is also evidence that other organisms, e.g., corynebacteria, found in association with the trichomonads may give rise to further pathological conditions.

While the diagnosis of trichomoniasis is not always a simple matter it has now been considerably simplified when the three methods are applied, viz., the history of the breeding in the herd, the direct examination of discharges from suspected cases, and the results of the recently introduced agglutination test. It must be clearly borne in mind that it may be necessary to use all three methods of diagnosis in order to establish the presence of the infection in the

herd and that the results of testing by direct examination and by the carrying out of the agglutination test may be negative in some infected animals. The tests are used for the diagnosis of the infection *in the herd:* once that fact is established the individually infected animals in the herd are not of such importance for the whole herd should be classed as an infected unit and all the female breeding stock should undergo treatment. The bull is the important disseminator of the infection and, until more information is forthcoming concerning the treatment of infected bulls, speaking generally, they should not be used for further service.

It would appear that control of infection in some herds is fairly easily accomplished. The cessation of breeding operations for some months, the individual treatment by uterine irrigation of the female breeding stock, including those which calve to time and appear to be healthy together with the disposal of the infected or carrier bulls will, in many cases, result in the elimination of the infection from the herd. There are, however, still investigations of importance to be carried out, especially from a laboratory point of view, before we can claim to be well acquainted with the various processes governing the infection.

General Articles

TRICHOMONIASIS IN THE COW

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NUMEROUS descriptions of the clinical symptoms of trichomonad infections in cows have been published in recent years, notably by Abelein (1932), Kust (1933), Andrews and Millar (1935), and Stableforth, Gould and Scorgie (1937), etc. The clinical picture shows considerable variations both in the symptoms and in the course of the disease. A noteworthy feature is that in different countries and even localities particular symptoms and lesions apparently predominate. Pyometra is regarded by some workers as the important lesion in their area. In Northern Ireland, where trichomonad sterility is prevalent, pyometra is by no means common. It is probable that many lesions regarded as having been induced by *Trichomonas fœtus* will be resolved into lesions and symptoms caused by associated or concurrent secondary bacterial infections, e.g., diphtheroids, streptococci, or other organisms. These infections may or may not have been introduced to that particular tissue through the agency of the motile trichomonad. At the outset it may be stated that these secondary infections constitute a serious complication to trichomonad histories in the field. This aspect of the clinical history is of considerable importance.

The first indication, sometimes the only one, that the disease is present in a herd is that several animals have returned to service; some of the animals may have successfully passed one or two periods and are thought to be in calf. In Northern Ireland, where the communal bull is much in evidence, it may be found that several farms using the same bull are experiencing the same difficulty. Thereafter these cows return regularly at three-week intervals. Eighty per cent. of the cows in the herd may be so affected. Sometimes the owner may note a slight discharge, occasionally a profuse one, but in many cases no discharge is observed. Such is a predominating feature of trichomoniasis in the cow in Northern Ireland.

Symptoms of Naturally Infected Cows

The following descriptions are based mainly upon the experiences gained during investigations, extending over some fourteen years, on North-of-Ireland farms. The clinical symptoms of artificially infected animals are discussed later in this paper.

The symptoms as manifested in the cow are dependent on several factors including:—

(a) the degree and virulence of the trichomonad parasite;
(b) the secondary bacterial infection;
(c) the farming system practised;
(d) constitution and environment.

For practical purposes the symptoms may be usefully divided into five categories, based partly on an earlier classification described by Neilson (1926).

(i) A low-grade endometritis.

(ii) A catarrhal endometritis.

(iii) Vaginitis and cervicitis.

(iv) Pyometra.

(v) Anœstrus.

These are given in the order of their importance. Eighty per cent. of affected cows may be placed in categories (i) and (ii). Vaginitis is more or less common to all groups. The remaining categories (iv) and (v) are about equal in importance. It is proposed to discuss vaginitis first as it is common to all groups.

Group III: Vaginitis

Kust (1933) and Daust (1934) state that a few hours after service by an infected bull an inflammatory change takes place in the vulva and the adjoining vagina. These organs may be swollen, reddened and sensitive. This has been attributed by others to the virus of vesicular exanthema. The author has been unable to confirm the presence of this symptom in naturally or artificially infected cows and heifers. The first symptom that the author recognises is the presence of a vaginitis which makes its appearance on approximately the third day after service, reaching its peak at about the ninth day. The intensity of the vaginitis, however, varies greatly. In its acute phase it is characterised by hæmorrhagic papules around the clitoris and by the presence of horizontal "pencil lines" of inflammation on the lateral walls of the vagina. After the ninth day these pencil lines of inflammation subside and are replaced by a dark diffuse vaginitis with a well marked proliferation of the surface lymphatics. This gives the wall of the vagina a harsh feeling to touch. Hopper (1941) describes characteristic granulations of the anterior vaginal wall and states that this lesion is specific for trichomoniasis. Flecks of a whitish pus are usually present around the clitoris. These flecks may also be creamy-yellow or golden-yellow in colour. The variations in the colour of the pus are related to the bacterial flora of the vagina. The pus later diminishes in quantity and may disappear altogether unless the cow returns to service when it will again be seen. This type of vaginitis was a striking feature of artificial infection in the heifers included in experiments (a) and (c). In the less acute vaginitis, symptoms and lesions may disappear in four or five days and may not be observed by the owner.

According to some workers (Hopper, *et al.*) the membrane of the cervix has a characteristic raspy feel and they consider that this symptom is specific. This is not the experience of the author; cervicitis has been noted on many occasions but is regarded as an extension of the infection from the anterior vagina. It is more probable in these cases that this condition is predisposed to by the trichomonad and that the actual lesion is attributable to secondary infection. In any case the author has not, despite the experimental evidence, satisfied himself that these lesions *in toto* are due to the pathogenic activities of *Trichomonas fœtus*. On the other hand, the presence of this symptom should always arouse suspicion of the possible or probable occurrence of *Trichomonas fœtus* and demonstrate the need for further investigation.

The granular vaginitis characterised by small, wart-like nodules of lymphatic

tissue has been found in many cases not associated with trichomonad infection and is more particularly seen in young heifers.

Group I: Low-grade Endometritis

The previous history of the vaginal manifestations are common to this condition and may be regarded as the precursor to the return to service. Œstrum returns at three or six weeks with evidence of little or no discharge. Although the animal may be mated at each subsequent period it fails to conceive. Flecks of pus may be seen around the clitoris about the second day following the return of œstrum. The œstral period may be irregular but the majority of animals return at the three-week period. In some cases after a cow has returned to service at regular periods for six months or longer she may conceive and carry her calf to the normal period, especially so if the cow has not been mated for some time. This seems to indicate a limiting factor in the disease and this observation has been recorded on many occasions. In addition, a herd affected with the low-grade endometritis form of trichomoniasis may undergo spontaneous recovery without the application of any treatment whatsoever.

The only symptom that may be shown by this type of case is the transient vaginitis together with an increasing number of cows returning to service.

Diagnosis by direct examination of the vaginal pus or secretion in these cases is usually unreliable as the free appearance of the trichomonads is sporadic in nature and of brief duration.

Rectal palpation of the uterus fails to show any feature of significance or specificity.

Group II: Catarrhal Endometritis

In this type of case conception takes place followed at a later stage by the death of the fœtus. This may occur comparatively early within the period of six to twelve weeks after mating.

The first symptom recognised by the owner is a slight white mucoid discharge which may be delayed in its appearance until the third of fourth month. This discharge increases in quantity and becomes more fluid. The peak of the discharge is at or about fourteen days following its initial appearance, after which it gradually subsides and becomes more mucoid in character. The discharge may persist for as long as six weeks or more and thereafter it disappears and no symptom may be shown other than that the animal remains sterile.

The small fœtus (mouse-size or slightly larger) may be aborted intact in its membranes. It is usually whitish in colour and somewhat macerated in appearance. There is no detectable odour or signs of putrefaction. Alternatively it may be completely macerated and not be recognised. Some farmers may be observant enough to note the presence of the fœtus but the majority fail to do so.

The North-of-Ireland farmer, in describing this type of case, invariably declares that the cow is "wasting her calf," an apt colloquialism which illustrates his impression of the phenomenon.

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The pre-peak phase is the best for the demonstration of the parasites which at this stage are very numerous. Thereafter they may quickly disappear and later examinations may prove negative. An examination of many cases of this type suggest that about one in three are found to show the parasite on initial examination. However, if it is possible to make repeated examinations a much closer ratio may be reached.

Many of these animals, though untreated, may come into œstrum soon after the discharge diminishes. A few may conceive and carry their calves normally, but the majority remain sterile. The results in experiment (c) suggest that infected cows may carry a normal calf yet may show active trichomonads in their genitalia.

Rectal examination of the uterus shows it to be thickened and both horns equally affected. The cervix is flaccid and open.

Not all cases follow the orthodox course. There is no arbitrary division between groups (i) and (ii) and transitions between them exist. The division is one of degree only. Conception probably takes place in such cases followed by early death of the fœtus and return of œstrus at six or nine weeks with little or no discharge. The parasite is difficult to demonstrate in these cases as its presence in the vaginal discharge is transient.

The agglutination test applied to this group as a means of diagnosis gives excellent results and it is the author's experience, following some 750 tests, that 80 per cent. of these cases will give a positive reaction. This is again related to the extent of the intra-uterine infection by *Trichomonas fœtus*. This point is fully discussed in a later paper devoted to uterine absorption experiments (experiment (b)).

Group IV: Pyometra

If conception takes place and the fœtus dies in utero, but is not expelled, pyometra may develop. In this type of case it is usual for the fœtus to undergo an early death and become macerated in the uterine contents. If found, the membranes and the fœtus are bleached, hard, and usually about three inches in length. In many cases no trace of the fœtus can be found in the uterus.

Hypertrophy of the uterus takes place and the size of the uterus is comparable to the expectant stage of the pregnancy. The contents of the uterus are fluid, slightly thick, and cream-like in consistency and usually odourless. The colour is whitish, although yellowish or slightly brown shades have been noted. The colour is probably governed by the presence of secondary bacterial infections, e.g., Coryne bacterium pyogenes pus is yellowish, and streptococcal infections, whitish. The cervix is closed and an anærobic cultural condition exists. The pyometra fluid is rich in cells and trichomonads are numerous, elongated and active. In most cases examined a persistent corpus luteum was present as in normal cases of pregnancy. It is not considered that this point is of cardinal importance.

Rectal examination of the uterus gives a doughy, fluctuating feel. The author has been unable to confirm Gould's (1937) finding that a particular and

peculiar tenseness of feeling is diagnostic. If the uterus can be drawn forward by means of vulcellum forceps fixed to the os uteri so that the bifurcation can be palpated, the uterus will be found to be distinctly flaccid and both horns are found to be equally distended. With the uterus still retracted palpation of the wall fails to reveal the presence of cotyledons or of the bones of a normal fœtus.

It is the practice of the author to carry out an agglutination test for *Trichomonas fœtus* in these cases. The results show a considerable proportion of high positive titres.

The uterine wall is, in most cases, slightly thickened, but cases have been noted where this wall has remained comparatively thin. The lining membrane is greyish and gives the appearance of a layer of inflammatory tissue. Throughout the membrane yellowish patches may be noted.

Group V : Anœstrus

Absence of œstrus is responsible for many cases of infertility. In herds where trichomoniasis exists a number of animals will be found in a state of anœstrus. In some outbreaks the incidence of anœstrus reaches 10 per cent. of the total of affected cows. On the average, however, the figure is somewhat lower. A complicating factor is that many of the animals, particularly heifers, are in poor condition during October to February, the period in which trichomonad sterility is most evident. This seasonal incidence is related to the current farming practice of mating the majority of cows in August and September to enable them to be calved in the spring. It is well recognised that heifers in poor condition are much more liable to develop anœstrus than heifers in good physical condition.

In this type of case no symptoms are recognised by the farmer. He states that the cow is not in calf, without showing evidence of return to service or of a vaginal discharge.

Rectal examination shows the presence of a non-pregnant uterus without any characteristic features. The ovaries usually show the presence of a corpus luteum. It is possible that conception had taken place, followed by an early death of the fœtus and without a radical change taking place, the corpus luteum remained persistent. In heifers in poor condition and suffering from anœstrus the ovaries are often small and inactive. In our experience in Northern Ireland it is recognised that the farmer seldom observes vaginal discharges, unless they are copious.

Discussion

Apart from the history of cows returning to service at irregular periods it is not possible to define any particular symptom or group of symptoms as being pathognomonic of trichomoniasis. An affected herd or group of herds in the same cycle of infection may show a predominating feature which may not be characteristic of other outbreaks. Also it is not possible to state that a discharge

of a particular consistency or colour is specific of that infection. The presence of breeding difficulties associated with the described symptoms or group of symptoms must be regarded as suggestive of infective sterility, the probable cause of which is *Trichomonas fœtus.*

The question has been raised on several occasions regarding the association or coexistence of *Brucella abortus* with *Trichomonas fœtus. Brucella abortus* infection in Northern Ireland is widespread and it is to be expected that on occasion both conditions may be concurrent. Where Brucella infection is in a quiescent state some confusion may exist with regard to the symptoms shown. If agglutination tests are carried out for *Brucella abortus* and *Trichomonas fœtus* little difficulty should be experienced in making the necessary diagnosis.

During the year 1928-29, 118 blood samples obtained from cows and heifers suspected of infective sterility were examined for the presence of agglutinins of *Brucella abortus.* The results showed that only seven were positive to the test.

On one farm a confusion of symptoms existed. An outbreak of contagious abortion accompanied by a crop of abortions at the seventh month and shown by the blood test to be due to *Brucella abortus* was followed in the next year by an active outbreak of trichomoniasis. It would have been easy to have fallen into the error of assuming that the symptoms due to trichomonad infection were a sequel to the original infection had not the agglutination test for trichomonas antibodies shown it to be otherwise.

In another case a complicated history existed involving the bull (vide clinical history of the bull). Two cows each aborted a mummified fœtus at seven months. The discharges showed the presence of *Trichomonas fœtus* and *Coryne bacterium pyogenes* but agglutination tests were Brucella negative.

One other point may be conveniently mentioned here. Kust (1936), Wagner and Hees (1937) and Salzer (1938), describe the finding of *Trichomonas fœtus* in the blood-stream of cows, heifers, mare, pig, dog, cat and human beings. Experi- Experimental work relating to this question is discussed fully in another paper. The author, following cultural examination of 136 bloods of cows, heifers and calves, has been unable to confirm their findings that *Trichomonas fœtus* takes up its abode in the blood-stream.

Diagnosis

Diagnosis is based on :—

(a) *History.* The herd history is of first-rate importance and is usually so characteristic as to suggest trichomoniasis at once. Confirmation is then made by the serological or by the direct method of examination.

(b) *Direct examination.* The parasite may be shown in vaginal secretions following service, abortion, catarrhal endometritis, and in pyometra. The discharge mixed with three parts of saline and preferably incubated for one hour at 37 deg. C. should be examined under a low power of the microscope for motile trichomonads. Using this technique the author has made positive diag-

noses on discharges collected twenty-four hours previously and sent by post to the laboratory, but the survival of the trichomonad in the secretion is very variable and may be very short in some cases. The actively motile protozoan is easily recognised. The attempt to detect dead trichomonads in a wet film is, however, a useless procedure. The presence of active trichomonads in the wet film is positive evidence and excludes further doubt. The author, however, considers that direct examination is not a completely satisfactory method as only one in ten of affected animals may show the presence of the organism at the time of examination. Also, the presence of the organism in such secretions is sporadic.

In Northern Ireland the direct examination method has now become secondary to the agglutination test. In many outbreaks the former method is not even employed. Reference to some results are shown in the four herd histories included in this section.

(c) *Agglutination test.* At the outset it must be stated that all infected animals do not react to this test.* In the author's experience the agglutination test gives an over-all result of 60 per cent. 80 per cent. may be found in clinical groups (II) and (IV). The variable degree of reaction is probably related to: (1) the degree of antigenic absorption; (2) the extent of uterine infection, if any.

The following are four typical histories of herds affected with *Trichomonas fœtus.* Nos. II and III are good examples of the use of the agglutination test; No. I is of the intermediate value, and No. IV the least satisfactory. This latter is an example of the featureless type of cow found when the infection is in a somewhat latent state.

It must be realised that in assessing the value of this test its function is not concerned with the detection of the individually infected animal for the purpose of their elimination but as a herd test for the *diagnosis of trichomoniasis in the herd.*

(I). No. 543. Stock: Nine Cows and One Communal Bull.

Initial return to service	Group	Direct Examination	Agglutination Test	
			Index	Result
Cow 1 3 weeks	I	NEGATIVE	11 : 8	Above normal
„ 2 3 „	I	„	11 : 8	„ „
„ 3 3 „	I	„	8 : 8	Normal
„ 4 3 „	I	„	9 : 8	„
„ 5 6 „	I	„	18 : 8	Positive
„ 6 12 „	II	„	11 : 8	Above normal
„ 7 12 „	II	„	15 : 7	Positive
„ 8 Normal pregnancy	—	—	8 : 8	Normal
„ 9 Ditto	—	—	10 : 8	Above normal

Bull Lazy Service—Disposed of prior to investigation.

At a subsequent direct examination of the vaginal discharges *Trichomonas fœtus* was seen in the discharge of cow (7) with the initial return to service at twelve weeks.

*The factors concerned with the presence of a positive or negative reaction will be discussed fully in a further paper.

(II). No. 406. Stock: Five Cows, Two Heifers and One Communal Bull.

Initial return	Group	Direct Examination	Agglutination Test	
			Index	Result
Cow 1 3 weeks	I	NEGATIVE	14 : 10	Positive
„ 2 3 „	I	„	15 : 10	„
„ 3 3 „ H	I	„	12 : 10	Above normal
„ 4 3 „ H	I	„	13 : 10	„ „
„ 5 6 „	I	„	17 : 10	Positive
„ 6 6 „	I	„	17 : 10	„
„ 7 12 „	II	POSITIVE	18 : 10	„
Bull		NEGATIVE	13 : 9	Above normal

H = Heifers.

(III). No. 656. Stock: Sixteen Cows and One Communal Bull.

Initial return to service	Group	Direct Examination	Agglutination Test	
			Index	Result
Cow 1 3 weeks	I	NEGATIVE	12 : 9	Above normal
„ 2 3 „	I	„	13 : 9	„ „
„ 3 6 „	I	„	14 : 9	Positive
„ 4 6 „	I	„	10 : 9	Normal
„ 5 9 „	II	„	13 : 9	Above normal
„ 6 3 „	I	„	12 : 9	„ „
„ 7 6 „	II	POSITIVE	17 : 9	Positive
„ 8 24 „	II	NEGATIVE	15 : 9	„
Bull		„	16 : 9	„
Lazy service				

The remaining eight cows were in calf, six had been mated by the infected bull and two by another bull. Of these six it was presumed that two had been mated prior to his infection some six months previously. Clinical and post-mortem examination of the bull's genitals failed to reveal the presence of *Trichomonas fœtus*. A complication in this herd was a prior outbreak of bovine contagious abortion and evidence of this was found on applying the agglutination test for *Br. abortus*.

(IV). No. 312B. Stock: Five Cows.

Initial return to service	Group	Direct Examination	Agglutination Test	
			Index	Result
Cow 1 3 weeks H	I	NEGATIVE	10 : 9	Normal
„ 2 3 „ H	I	„	9 : 9	„
„ 3 6 „	I	„	10 : 9	„
„ 4 3 „	I	„	12 : 9	Above normal
„ 5 12 „	II	POSITIVE	16 : 9	Positive

It has been shown that the finding of one or more positive blood samples from a suspect herd is sufficient to determine the diagnosis. The Ministry of Agriculture of Northern Ireland through the Veterinary Research Division has made the examination of blood samples for trichomoniasis a routine service to the veterinary practitioner. The results in the field over a period of three

years indicate that for purposes of diagnosis complete reliance may be placed upon the herd history and the positive agglutination test.

Treatment

Neilsen's technique was adopted in Northern Ireland in 1927, when large-scale measures were taken to treat cows suffering from infective sterility. The quantity and strength of the iodine solution then used was 200 c.c. of a 1 :200 solution. The results obtained from this treatment were very satisfactory and more so when one considers that a certain percentage of animals may suffer from permanent sterility following salpingitis. In addition, although the main features of trichomoniasis were well recognised at that time the etiology was unknown and the disease was simply regarded as " Sterility Disease."

In the Ministry of Agriculture, Government of Northern Ireland, Annual Report, 1929, it was stated that an investigation of over 800 cases showed that an average of 75 per cent. of the treated cows subsequently proved in calf. In the Annual Report of 1928 it was stated that of 384 cases supervised investigation showed that almost 90 per cent. proved in calf. Later, Kerr and Lamont (1938) supported these results.

Successful results depend not only on the efficient application of the iodine treatment but also on avoiding reinfection of treated cows. In this area particular emphasis was placed upon the instruction to the owners not to send their cows to infected bulls.

Some Considerations of the Iodine Treatment

The treatment for endometritis advocated and described by Neilsen (1926) consists in douching the uterine cavity with an iodine solution. Williams (1921) states that it is technically impossible to disinfect the uterine mucous membrane against bacteria without destroying it. In dealing with *Trichomonas fœtus* infection this observation is not correct. Iodine in a strength of 1 :7,500 and in the presence of a 1 per cent. peptone solution causes instantaneous death of the trichomonad (Kerr, 1942). In the presence of catarrhal pus aspirated from a pyometra case a 1 :2,000 iodine solution caused immediate death of the trichomonads present. On this evidence the author concludes that in the treatment of trichomoniasis in the cow a 1 :400 or 1 :600 solution of iodine provides a wide margin of safety, one which will sterilise the *Trichomonas fœtus* infection and at the same time not seriously affect the mucous membrane. This applies more particularly to the treatment of low-grade and of catarrhal endometritis.

The uterus has a high degree of tolerance to iodine solutions. A post-mortem examination made upon a cow four days after 100 c.c. of a 1 :400 solution of iodine had been injected into the uterine cavity, showed little evidence of inflammatory change other than some œdema in the submucous tissue. In a series of three cows 100 c.c. of 1 :100 solution of iodine was injected into the uterine cavity. Particular care was taken to prevent the iodine solution infiltrating around the cervix and back into the more sensitive parts of the vagina. These three animals showed no excess of discomfort as indicated by

straining, and, in fact, each animal appeared normal thirty to sixty minutes later.

An important advantage in the case of iodine solution in the strength of 1 :400 is that it does not coagulate mucus.

In the treatment of endometritis the final choice of the strength of the iodine solution to be used depends on the clinical examination of the individual case. In the group classified as a low-grade endometritis and where clinical examination shows the uterus to approach normality in size and with the presence of little or no discharge a 1 :600 solution is found to be sufficient. On the other hand, in the treatment of the group classified as catarrhal endometritis a 1 :400 solution is preferred.

Rupture of the Uterine Muscle

The volume of solution used for uterine irrigation requires consideration. The author and his colleague (H. G. Lamont) have injected various quantities of a weak solution of methylene blue into the uterus of non-pregnant cows immediately before slaughter. The *modus operandi* consisted in inserting the point of the catheter just beyond the inner ring of the os uteri and then injecting a measured quantity of the solution. It was found that a 50 c.c. volume of methylene blue solution penetrated completely into the tips of both uterine horns and even stained the terminal portion of the mucous membrane of the Fallopian tubes.

The author and his colleague have never advocated the insertion of the catheter into the horns of the uterus. Their experience as the result of numerous experiments indicates quite clearly (1) that it is unnecessary, and (2) that it is an extremely dangerous procedure which often results in perforation of the uterine horn.

In the living animal it is very easy to push the tip of the catheter through the uterine wall. There is no noticeable resistance and in fact it has been likened to passing the catheter through a thin membrane of bakers' dough. Smythe (1942) also emphasises that it is unnecessary to direct the catheter into the uterine horns. He also draws attention to the dangers of injecting a too great volume of fluid; he found that rupture of the uterine wall occurred when 6 oz. of fluid were injected. Smythe, however, used the uteri from animals which had been slaughtered immediately prior to his experiments so that complete reliance cannot be placed on his findings, for: (1) the tonicity of the uterine muscle in the live animal is vastly different from that of the dead animal, and (2) the sphincter effect of the os uteri is much more rigid in the dead animal.

The author's experiments in this connection are as follows. Twelve sterile cows were selected at random and an 8 oz. volume of a weak methylene blue solution was injected into the uterus of each. The technique adopted was to fix the os uteri with the vulcellum forceps and then insert the catheter carefully through the os. The catheter was withdrawn so that the tip was just inside the os. By using this technique the author and his colleague find it unnecessary to retain a hand in the rectum to define the passage of the catheter into the uterus. There is no risk of injecting the fluid into the peritoneum, and the site of

XUM

operation is not so liable to contamination with fæces. If this technique is not used then it is absolutely essential to retain a hand in the rectum to ensure that the catheter has not perforated the uterus, and, in fact, the author recommends any inexperienced operator to do this as it is so very easy to perforate the cornual wall.

The results were as follows:—

(a) Four cows retained 8 oz. without rupture of the uterine wall.

(b) Seven cows retained less than the 8 oz. without rupture of the uterine wall, the excess of methylene blue solution infiltrated back into the vagina.

(c) One cow showed rupture of the uterine muscle with 8 oz. of fluid. The dye solution showed that a slight split of the longitudinal muscle of the dorsal wall of the uterus in the region of the cornual bifurcation had taken place, the dye solution infiltrating between the muscle fibres and the covering visceral membrane but not into the peritoneal cavity.

Further experiments, using quantities varying from 3½ oz. to 5 oz., have been made. The solution penetrated to all parts of the uterine mucous membrane and in no instance was any evidence of rupture detected, and the author's view is that this quantity of fluid is quite sufficient for uterine injection into the average cow and the risks of rupture are negligible. He also considers that operators wishing to practise this operation should, when possible, experiment with sterile cows prior to their slaughter by injecting a weak methylene blue solution into the uterus. They will thereby gain confidence and a much truer perspective than that obtained by description only.

Rupture of the uterine muscle by either method is undoubtedly the cause of many of the acute abdominal colics that follow this operation. When perforation occurs a few ounces of iodine solution may be injected into the peritoneal cavity. This irritates the peritoneum and induces the outflow of an abundance of peritoneal exudate which neutralises the irritant effect of the iodine. The iodine and exudate are quickly reabsorbed and the animal returns to normal in an hour or two. The power of recovery of the uterine tissue is great and the damage is soon repaired. The author, in many hundreds of cases treated, has not encountered a single fatality following the intra-uterine injection of iodine solution.

One further point in the technique of this operation may be worthy of consideration. It has always been advocated in Northern Ireland that in withdrawing the catheter care should be taken to irrigate the uterine canal and the cervix. This undoubtedly causes some degree of irritation to the animal. Nevertheless, it is an essential part of the treatment as the crypts and crevices around the cervix must be regarded as a potential reservoir of trichomonad infection.

Prognosis

Group I.—Low-grade Endometritis

The future breeding possibilities of treated animals of this group are excel-

lent. In practice over 90 per cent. should respond to treatment; and an entirely favourable prognosis may be given.

Group II.—Catarrhal Endometritis

Prognosis of this group following iodine treatment must be guarded and depends largely upon whether or not the salpinx is involved. With the appropriate treatment the uterine mucosæ has a wonderful power of recovery, but the presence or absence of salpingitis, which is almost always bilateral, is the criterion as to the future breeding possibilities of the animal. If the œstral cycle is normal the probability of the operation giving a successful result is much improved. It is not necessary for the Fallopian tubes to be grossly thickened and palpable to cause permanent sterility. In early cases of salpingitis the tubes cannot be palpated. The principal clinical evidence of such a condition is persistent sterility in spite of treatment and often associated with an irregular œstrus.

Cases where an open and flaccid os uteri is evident do not yield satisfactory results to treatment.

Anœstrus responds to hormone and iodine treatment and a satisfactory prognosis may be given.

The results achieved in Northern Ireland in fifteen years' experience of this operation has been based upon the practice of one intra-uterine injection of iodine in cases of low-grade endometritis and of the more simple cases of catarrhal endometritis. In the chronic and more purulent cases a second injection is advocated. Catarrhal endometritis of the type following retention of the after-birth and contagious bovine abortion is usually much more resistant to treatment and may require further injections before the uterus returns to normal.

In connection with the use of iodine in the treatment of cows affected with *Trichomonas fœtus* the author considers that where the operation is properly carried out in the groups classified as I, II, III and V, and using a 1 : 400 solution, the genitalia of the treated animal may be declared free from trichomonad infection. In no case following artificial or natural infection has *Trichomonas fœtus* been found subsequent to the treatment. He has found treated animals, however, to be susceptible to reinfection following mating with a known infected bull, a factor of importance and one which indicates that the question of immunity to this infection requires investigation.

The essential factor in obtaining a high percentage of success in the treatment of this disease is the early application of the iodine treatment in association with the necessary preventive measures. This is the fundamental reason for the need of the education of the stock-owner as to the venereal nature of the disease and the fact that successful treatment can be achieved in a large percentage of affected cows.

It would seem, also, that in artificial insemination exists a means for controlling trichomonad infection.

(To be continued)

A COLONIAL VETERINARY DEPARTMENT IN PEACE AND IN WAR

By R. J. SIMMONS, C.B.E., M.R.C.V.S.,
Director of Veterinary Services, Uganda

In discussing the effect of the war on veterinary activities in Uganda, and the part played in the war effort by the veterinary profession, a brief description of pre-war conditions might enable the reader to gain a clearer picture of the background of the past, and therefore a better appreciation of the rapid developments which have taken place within the last decade or so.

Until within recent years the role allotted to the veterinary departments in the Colonies was apt to be a very restricted one, that of curative medicine alone, not perhaps the most interesting aspect of the home practitioner, that of physician and surgeon to individual highly-bred and highly-priced animals, but the wholesale immunisation and treatment of thousands of stock at a time. This view was undoubtedly forced upon us by the frequent widespread outbreaks of diseases such as rinderpest and pleuro-pneumonia, which, annually, seriously depleted the livestock of the country, affecting in no small degree the life and happiness of the African stock owner who lived in constant fear that at any moment fate, in the shape of disease, might sweep away with little or no warning his whole herd, which to all intents and purposes was his bank balance. Thus the primary aim and duty of each veterinary officer became that of saving life, by devoting all his energies to the eradication of the more serious epizootics which at times took their toll, not singly, but in thousands, as they swept across the countryside.

As time went on, and methods of immunisation and disease control improved, there was a marked diminution in the former widespread outbreaks of disease, and a corresponding increase in the livestock population. There was, however, still little or no attempt to seek outlets for surplus stock or stock products, for it was considered that the future prosperity of the African lay in the intensive cultivation of cash crops such as cotton, groundnuts, etc., livestock being looked upon as a necessary evil, and the cause of soil erosion, but still important as an integral part of the social life of the African. For this view veterinary officers were, perhaps, as much to blame as anyone, for, with the exception of a few pioneers, it was considered somewhat beneath the dignity of a man well versed in the arts of medicine and surgery to apply himself to the commercial side of stock raising and the marketing of products such as hides and skins, ghee, butter, meat, etc., much in the same way as at home to-day many practitioners would scorn to treat poultry, no matter their value or the number concerned.

It is not surprising, therefore, that as stock increased in numbers, coincident with the introduction of the plough and more intensive and widespread cultivation, murmurings were heard abroad as to the advisability of maintaining expensive veterinary departments whose sole aim and object appeared to be to encourage the breeding of ever-increasing numbers of useless stock, thus overburdening areas already beginning to show signs of over-cultivation and overgrazing.

Fortunately, at about this time there was a faint stirring of interest in problems of African nutrition and the necessity for its improvement, this being brought about through the sudden demand for labour for the construction of public works such as roads, railways, etc., and it was borne in upon even "the old stalwarts" that a new era had begun and a reorientation of livestock policy was necessary.

A start was made by opening a few small stock markets in the upcountry areas, butchers from the towns were encouraged to attend, and soon the nucleus of a market system was in evidence.

During the next few years an ever-increasing number of markets were opened, quarantines and outspans demarcated, regular trade routes organised, and we were at last able to show that veterinary control was a definite asset to the country, and was enabling the stockowner to turn stock raising into a profitable undertaking. Concurrently we were endeavouring to blend stock raising more closely with pure agriculture, efforts were made to control grazing, the use of manure on the land growing the cash crops was stressed, castration of surplus bulls to produce better bullocks for ploughing was pressed forward with selective breeding and culling of herds advised, and innumerable other lines of definite advanced followed.

Investigation was then commenced into the extent of tsetse fly belts and their constricting effect on grazing lands, and, wherever practicable, large-scale clearing operations were undertaken. Attention was also paid to water supplies, and the conservation of grazing, demonstrations were given in the proper preparation of hides and skins, ghee, etc., and, in short, an endeavour was made to lay the foundations of a sound livestock programme of development.

During the five years or so immediately preceding the outbreak of the present war progress along all these lines was rapid, and it was apparent that livestock had now ceased to be looked upon as a liability, it had assumed its proper place in the agricultural life of the country, that of a most valuable asset both to the owner and the land.

The commencement of hostilities in Africa, therefore, did not find the livestock industry unprepared for rapid development, and, notwithstanding the loss of close on 50 per cent. of the staff to part or whole time war work outside the department, we have been able to contribute our share to the ever-increasing demands for supplies of stock and stock products for the war effort. At the present moment we are supplying cattle on the hoof and by rail to a neighbouring territory for slaughtering as fresh meat or for canning purposes, and by road, rail, and steamer many thousands of head pass monthly along the trade routes of the country to our own main consuming centres. All stock are moved under veterinary permits, are quarantined, inspected, and branded, at various loading points, and are never far away from the watchful eye of a member (European or African) of the Veterinary Department. It is estimated that the present reduction rate is approximately half a million head of cattle a year, together with a much larger number of sheep and goats, the vast majority of these animals being slaughtered and sold in the chief markets or in the

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thousands of small butchers' shops springing up everywhere throughout the countryside.

Unfortunately, it now seems that we have reached the stage where the demand is greater than the supply, large numbers of oxen are required for trek and ploughing work, more than ever are needed for canning or for fresh meat for military, naval, prisoner of war and refugee camps, and, to add to the drain on supplies, the local African demand for fresh meat is rising rapidly. We are now slaughtering annually approximately twenty per cent. of our cattle population, and, as the zebu is a slow maturing type of animal, this is undoubtedly too high a percentage, it is obvious that some form of control will have to be operated before long.

To turn to the question of stock products, with the necessity for economy in shipping space it became essential to ensure that only high quality hides should be exported to the United Kingdom; experiments in preparation methods were carried out and eventually it was decided to concentrate on "frame" drying, to the exclusion of the old method of sun-drying on the ground which produced a very inferior type of hide. The shortage of timber in some areas, and the long rainy season in others preventing quick drying, precluded the use of drying houses or "hide bandas" as they are sometimes called locally. The frame drying method has proved very successful and the tanners report that the quality of hides exported has improved beyond all expectation.

The production of ghee and butter for military purposes also occupied our attention and ghee posts were opened up in the various outlying stock raising areas. This business is now thriving and we are endeavouring to become self-supporting in this line so as to avoid importation from neighbouring territories who export to the United Kingdom.

With a view to further economy in foodstuffs, pig-keeping amongst the small peasant landowner in the busier areas is now being encouraged and is flourishing rapidly; the first *African* pork butcher's shop will soon be opened in one of the main municipal markets, and the brisk local demand for pork for European and African consumption is being supplied from local sources, instead of being imported as was formerly the case.

Advantage was also taken of the rapid expansion of the African meat trade to push forward with attempts at improvement of slaughtering conditions. It is pleasant to record that already there are many hundreds of small butchers' shops along the roadsides, some well built with concrete floors and corrugated iron sides and roofs, others of mud and wattle construction with thatched roofs, all comparatively well equipped, although in a somewhat primitive fashion.

Other recent activities include investigation into new methods of eradication and control of tsetse belts, the construction of dams and reservoirs in dry areas, and general propaganda work on breeding and improvement of stock.

Meanwhile, at the Laboratory, steady investigations into the cause, effect, and methods of control of local diseases, including deficiency diseases, are being carried out, new drugs are being tested, and vaccines and sera prepared for field use. Here also is situated the Veterinary School, a part of Makerere

College, where students complete their five-year course of studies to enable them to obtain a Diploma in Veterinary Science.

At a small up-country stock farm, under the control of this department, feeding experiments are being carried out on the value, use and cost of locally grown concentrates, the problems of paddocking stock and the carrying capacity of paddocks containing stands of local or imported grasses are being studied, and other aspects of stock breeding and raising, from the African point of view, are being dealt with.

One could go on *ad infinitum* mentioning activities which, although perhaps on a much smaller scale than the foregoing, are still no less important to the main pattern of things. However, the foregoing will serve to illustrate the diversity of work grouped under the heading "Veterinary Departmental Activities" and will enable one to appreciate the breadth of outlook and wide understanding required of the present-day young veterinarian in the Colonial Service; he must be essentially practical in outlook, and yet have a bent towards research, have a sound knowledge of farm stock *in health* as well as in sickness, be prepared to evince interest in any aspect of stock raising, whether or not it appeals to him personally, and last, but not least, possess unlimited patience and good humour.

As to the future, political, social, or economic, of Eastern and Central Africa, at the present critical stage in the Empire's history who can tell, or who dare prophesy what shape it will take, but all that need concern us at the moment is that we should endeavour to pave the way to-day for those who follow to-morrow. One thing is sure, however, there must be, and will be-development and progress, probably at a breath-taking speed, more especially during the immediate post-war years. Let us hope and trust that when the time comes the veterinary profession will be ready and well equipped to play its part, and not be weighed in the balance and found wanting.

THE VETERINARY SURGEON AND LIVESTOCK INSURANCE

By Professor J. McCUNN, M.R.C.V.S., M.R.C.P., L.R.C.P.

Professor of Anatomy, The Royal Veterinary College

For many years I have been interested, from the purely professional point of view, in livestock insurance. Livestock insurance could not exist without the services of the veterinary surgeon, for both insurer and insured look to him to hold the balance fair. The veterinary surgeon, therefore, stands in a very responsible position as between the parties involved, and the advice which he gives should be arrived at only after due consideration. Rash or ill-considered advice may undermine the confidence between the parties and lead to litigation. Litigation should be avoided if possible, for in the long run the law will take its toll. I have frequently been called upon to act as arbitrator in cases where there has been conflict of veterinary opinion. On most occasions it has been a simple matter to settle such differences, for they have occurred only as a result

of two or more people looking at a particular problem from a different angle but with no great divergence as to facts. In a number of cases, however, I have reluctantly come to the conclusion that the conflicts between the parties have been initiated and, indeed, stimulated by the veterinary surgeons involved. This statement applies equally to both sides. I am confident that in most cases the impasse has been due to the fact that the veterinary surgeons involved had not made themselves conversant with the terms of the contract between the two parties. A better understanding of the terms and implications of livestock policies would obviate much of this trouble.

It is with this in view that I sought the opinion of a competent authority in order that the attention of members of the profession might be drawn to the conditions which cover insurance risks as accepted by most offices.

The upward trend of prices for horses and cattle has brought the question of livestock insurance into prominence, and the following notes are contributed by way of information to veterinary surgeons who may be asked for advice on the subject, or who may be called upon to act for their clients in connection with matters of the kind.

Veterinary surgeons will be in a better position to respond to calls made on their services in insurance matters if they are fully conversant with the main features of livestock policies. The forms of cover at present in use have been developed through years of experience to meet the needs of stock owners. At the same time it is obviously necessary for the cover to be limited in such a way that the hazards can be properly measured and that the rates charged can be adjusted to ths risks.

Livestock policies are contracts of indemnity, which means that the amount recoverable by the insured is the market value prior to the accident or illness causing death, not exceeding the sum insured by the policy. In no case, therefore, should the sum proposed for insurance exceed the actual value of the animal. In the case of a recent purchase the cost price is usually considered to be the market value and only rarely is a company able to give cover for a higher amount. Since the contract is one of indemnity, the insured must not make a profit out of his claim and there is no point on which investigation of a claim has to be closer than that of value. On the principle that it is better to prevent a difficulty from arising than to have to settle that difficulty when it arises, it is realised that the time to agree on this and any possible contentious points is at the time of proposal, and, so far as possible, this is done.

The cover given by the policy is against death by accident or from disease, and the death must occur (a) during the currency of the contract and (b) from a cause which has arisen during the period of insurance.

It is clear from this that the policy does not cover the insured against loss which he may sustain through an animal becoming unfit or incapable of fulfilling all the functions or duties for which it is kept or employed, e.g., if a cart-horse meets with an accident and its injuries, while not proving fatal, prevent it from being used, no sum is recoverable under the policy. Under the normal policy there is no liability for depreciation of value of the animal.

This is a position which may cause misunderstanding in the mind of the insured, because if the injury does not prove fatal or necessitate destruction on the grounds of humanity, there is no claim, whereas if it had caused death, the claim would have been payable in full. The contract, however, is one of "the utmost good faith" and the insured is bound to take such steps to protect the life of his animal as he would have taken had he been uninsured, and he must, at his own expense, obtain the services of a qualified veterinary surgeon in order to comply with the policy conditions. The animal may not be slaughtered without the consent of the company.

It is at this point that the position of the veterinary surgeon becomes important. If, on humanitarian grounds, the animal should be slaughtered, the insurance company will, of course, not resist, but the position is not always an easy one. From the point of view of an insurance company, it is important that the control of all questions relating to the slaughter of insured animals should not pass out of its hands, since otherwise the policy-holder may be swayed by purely economic considerations. The test applied by insurance companies is whether or not slaughter is necessary for humanitarian reasons; if it is found to be so, immediate consent will be given.

If on the veterinary evidence the insurance company decides that slaughter is not necessary for humanitarian reasons, the policy-holder is not entitled to have the animal slaughtered, but he may be informed by the company that if the animal is slaughtered by its owner because he feels that it is humanly necessary to do so, while he does so on his own responsibility the company will be prepared to investigate the question further, notwithstanding that the animal has been slaughtered in the meantime.

Appreciation of the legal position of the insurer and the owner will show a veterinary surgeon the importance of basing his opinion strictly on the humanitarian question to the exclusion of all questions of loss to the owner or to the insurance company.

Interesting examples may be given of the sort of difficulty which can arise. A steeplechaser may break down in the tendons. He recovers but is bowed on the tendons and the fetlock may be dropped right down. Obviously, as a steeplechaser or indeed at any other job he may be useless. At the same time he may enjoy good general health and be free from pain. Such a case does not fulfil the requirements of the usual insurance contract. Insurance implies a contract between two or more parties. The terms of such a contract are specific and it is only by strict observance of these terms that insurance is made possible. This criterion applies with special emphasis in the case of livestock.

In investigating claims on behalf of insurance companies, veterinary surgeons should not only see the animal or carcase but consult with the attending veterinary surgeon and ascertain from him and the owner how, when and where the accident or illness occurred and the date the veterinary surgeon was first called in. The veterinary surgeon's report should be comprehensive and should give a correct description of the animal, its value, nature of illness or accident, or cause of death, how it occurred and any other information bearing on the circumstances

of the claim. It should be emphasised that companies only seek to satisfy themselves that a claim is in order and place great reliance on veterinary surgeons, and rely very largely on the integrity of the veterinary surgeon to ensure a just settlement. If the animal is alive and the veterinary surgeon is of definite opinion that slaughter is necessary, he should telephone the company and, if unable to do so, should act on his own discretion, as no company would wish needlessly to keep alive an animal suffering severe pain; but the carcase should be retained pending the company's instructions.

Loss due to slaughter under the Diseases of Animals Act or under any Order of the Privy Council or Ministry of Agriculture or any Local Authority is a normal exclusion from the policy. The principal diseases to which the exclusion relates are tuberculosis and foot-and-mouth disease, and in respect of the latter compensation is paid by the Government on the full value of all the animals destroyed by their order; and the Ministry of Agriculture has made it known that it will regard an insurance payment in such cases as against the public interest.

Finally, in most cases the question of value will arise. It may be at the time of insurance or when a claim is being or has been made.

If the animal should be classed as an ordinary specimen of its species, the veterinary surgeon will meet with no difficulty. If, on the other hand, its value is a special one and based upon a reputation gained through pedigree or value at stud, a veterinary surgeon will be well advised to decline to value such an animal.

After stating the facts of the case, he should suggest that, as the animal is one of special value, the services of someone who is a recognised expert on such values should be sought. This has been my own practice. I have never met with any objections to this course from the parties involved and I am certain that it has saved me from many a pitfall.

THE ROLE OF THE EXPERT WITNESS

By A. C. DUNCAN, B.Sc., F.R.C.V.S.
Barrister-at-Law

An onlooker may well consider that we have all gone a little mad. Big business men are declaring that private enterprise has failed; others, again, that Christianity has failed; and even in our own small profession as veterinary surgeons a number seem to be toying with the idea that the private practitioner must go, and be replaced by a body of slaves obeying implicitly the behests of a nebulous body known as The State, diagnosing, inoculating, and treating disease only according to the rules laid down by this body.

This " State " which all must worship, in reality consists of a small number of the more vociferous of our citizens, and as this Moloch has no special knowledge of anything in particular, they appoint a small number of qualified men, who in turn issue the orders to the thousands who must carry them out. These

latter, by the way, have exactly the same training and qualification as the selected few, but possess also the added experience gained by contact with the owners of animals, who in many cases will judge by results.

Now, while this attitude of mind may be deplored, there is some small justification for discontent, and the fault may lie with the individual, who has not always considered that his rights, as an individual, are accompanied by corresponding obligations to the community.

The community will acknowledge these rights if they are satisfied that they will get honest, straightforward service in return. In the majority of cases they do get it, but, unfortunately, sometimes they are given the impression that they are not getting a square deal.

One way in which veterinary surgeons, though perfectly honest, may convey this impression is by the unfortunate manner in which evidence is given in court cases.

There is but little excuse for this fault since there is, or should be, in the hands of every veterinary surgeon a handbook prepared by the registrar which gives minute detail on this and other points of behaviour.

Since it would appear that there are some who have not studied this book, it may not be out of place to recapitulate some of the important points.

The Courts of Justice in this land of ours are strictly impartial and unbiased, and are solely concerned with the elucidation of the whole truth. This is one of the few things in our civilisation of which we can be unashamedly proud. And, that being so, we should endeavour to assist the court by evidence which, in the words of the oath, contains the truth, the whole truth, and nothing but the truth.

The evidence which may be required of veterinary surgeons may be of fact or expert. It is with the latter that we are at present concerned.

At the outset the veterinary practitioner is frequently faced with a difficulty, for it is probable that a client, who provides a source of income, and is often a friend as well, may ask him to support his case with the necessary evidence. It may, therefore, require some courage to explain to the client the position of a veterinary expert witness, namely, that a certain opinion has been formed after careful examination and consideration and if that opinion supports the case, well and good, but, if not, it might be better not to give evidence in the case. But in no case can that opinion be modified or moulded merely to support the contention of the client.

This may be regarded as an unfriendly act and may even result in the loss of a client. He (or his solicitor) may try to persuade the hoped-for witness just to say so and so and omit what is deemed to be unfavourable.

Although the path of the righteous may be hard, one must be firm in this, for in such conduct lies, to a great extent, the justification of the individual veterinary surgeon to high consideration, and more especially because of the publicity given to court cases.

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It may be some comfort to the younger practitioner to reflect that the client may not be lost after all, for on consideration he will probably discern the right motive which prompted the action.

In taking up this attitude it is hardly necessary to say that the opinion so formed must be most carefully reasoned opinion, such as one would be prepared to defend against cross-examination.

It is not sufficient to make wild statements, such as: "I am sure the animal must have been poisoned, because I cannot see anything to account for its death." Or, again, in an action for damages for the loss of cattle alleged to be due to sewage poisoning: "I am certain that it cannot be good for animals to drink such muck." It is wise to remember that you will almost certainly be asked to explain the reasons for your opinion, and the steps you have taken, where such are available, to verify it.

It will be advisable, therefore, to make notes of all the circumstances, especially in such cases as may give rise to legal action. Any specimens which might assist should be preserved and marked for identification, also X-ray photographs and microscope slides.

The case on which the veterinary surgeon is invited to give evidence may occur in the course of his own practice, or he may be specifically asked to examine a case for the purpose of evidence.

The question of value frequently arises, and although the veterinary surgeon is not a valuer, he should familiarise himself with current values, as his opinion on this point is commonly invited. For this reason it is well to note at the time of the examination the condition of the animal, the approximate value, and the amount of loss, total or partial, in case his opinion should be asked.

If, during the examination, the owner or attendant should make any statement affecting the case, this should be carefully noted.

Following the examination an interview will probably be arranged with the solicitor for the client on whose behalf the examination was made. At this the veterinary surgeon will state what is his opinion formed on the case, giving the reasons for that opinion much as they might be asked for in court.

He should be most careful to avoid overstatement or exaggeration which might mislead his client's solicitor, who is to a great extent building his case on the information he is now receiving. For this reason, too, some pains should be taken to see that the solicitor clearly understands the technical expressions used and their implication. Where there exist points of doubt these should be explained.

Sometimes the solicitor may press for a positive statement on some doubtful point, such, for example, as the duration of the condition found. One should resist the temptation to be positive beyond what is clearly demonstrable.

At this interview the veterinary surgeon may well bring to the notice of the solicitor any reference in an authentic and recognised text-book which may

explain or substantiate the opinion given. Where such text-book is referred to it should, if possible, be a modern edition.

The majority of cases in which a veterinary surgeon will be called to give evidence will be heard in a county court.

Many persons attending court experience a certain amount of nervousness, and, according to the nature of the individual, this may be expressed either by timidity or truculence. Both such should be overcome as far as possible; and the reflection that the witness has conscientiously carried out the examination in a complete and painstaking manner, and formed an opinion based on sound reasoning, should go far to reassure him. He may consider himself to be an assistant to the court rather than a contestant.

When called to give evidence the oath is administered. This is a serious statement, not merely a formality, and should be treated as such.

The witness then gives evidence in the form of answers to questions put by counsel for the client on whose behalf the evidence is given. The answers given to counsel's questions should be addressed to the judge, or in cases where there is a jury, to the latter.

From now on the expert witness must remember that counsel alone is in charge of his client's case, the witness being there merely to assist the court.

This advice may be as hard to follow as that given to every golfer—to keep his eye on the ball—but in its own sphere is equally important.

At the commencement some formal questions are put to establish the identity and qualification of the witness.

Then follows the principal evidence; it should be given clearly and succinctly. It is well to remember that much of the evidence will be written down, it will therefore be in the witness's own interest to speak slowly so that it can be transcribed accurately. This will also save some irritation on the part of the writers.

The language of the expert witness should be as simple and free from technicality as possible. This is no occasion for the display of erudition, nor will it be appreciated by the court. So if it should be necessary to refer to a dried egg, it is best to say so rather than call it a dehydrated ovum.

Should the witness be asked a straightforward question, to which the answer plainly is "yes" or "no," he should not hedge, out of consideration for his client's case, but answer in a straightforward manner. In all probability this action will react favourably on his client's case, and will certainly prejudice the Court to view favourably the rest of the evidence.

In the course of examination the professional witness should be careful to avoid casting ridicule on, or belittling the opinion of a brother professional witness. If the matter is one in which there is room for an honest difference of opinion, this should be freely granted, though the witness may give the reasons for his own, and, as Dr. Bulloch says in his handbook, "it will be all to the good if he can produce the impression on the court that he is neither vain nor conceited, but single-minded and honest in the opinion he holds."

Counsel, during his interrogation, will endeavour to bring out the circumstances most favourable to his client. He is an exception to the rule in this respect and is expected to be biased, but, with the exception of the opposing counsel, no one else in court should be so.

The examination-in-chief is followed by cross-examination, when counsel for the other side will put questions intended to expand or explain the answers previously given in a manner favourable to his own side or to bring out relevant matter which has been omitted in the examination-in-chief.

Sometimes the attitude of opposing counsel may appear less friendly. He may possibly raise suspicion of the experience of the witness, or try to induce him to contradict a previous statement, or suggest that the symptoms or condition described by witness might, in fact, refer to some different disease or condition.

This questioning may prove very irritating to the witness, but at all costs he must refrain from either losing his temper, or attempting by smart repartee to outwit counsel. In such a contest of wits he would be at a grave disadvantage, for however fierce the counsel may appear, he is probably not at all out of temper, for it is his daily life.

The witness has, however, one weapon which he can use to advantage, namely, a sound technical knowledge of his own subject, and if he has taken the trouble to consider well and marshal the facts on which he relies for his opinion he should be difficult to confound, and is likely to bring credit both to himself and to the profession he represents.

Should any misunderstanding arise during the cross-examination the witness may be re-examined on this, on which the evidence will terminate, unless recalled for the further clearing up of any doubtful point.

The following examples of the types of cases which may present difficulties to the veterinary witness will be familiar to most practitioners and may be helpful to those commencing practice.

1.—Soundness in horses. Much has been written on this subject. The points which may arise in legal cases are mainly: (1) was the animal sound when sold? (2) was the animal rightly found to be unsound at a later date? and (3) if so, could the unsoundness have arisen in the interval of time?

The question of a warranty does not here concern the expert witness although it will be considered by the court. Regarding (1) the examining veterinary surgeon, who may later be a witness, should not allow a private interpretation of a word or technical expression to mislead the purchaser or the court. For example: A horse sold with a certificate that it was sound was later examined and rejected as unsound on account of ringbone. In court, examiner A said that he found no ringbone. Examiner B said there was a large ringbone. On being pressed by counsel, examiner A admitted that there was an exostosis, but as it was not on the joint he would not call it a ringbone. Now, examiner A may or may not have been justified in holding an honest opinion that an exostosis on the centre of the os suffraginis might not be a serious detriment, but he was wrong in that he did not make the position clear.

As regards the duration of the condition found on subsequent examination, one ought to be careful particularly to ensure that the opinion given is in reality the scientifically considered judgment of an expert and not merely a wild guess. As example: Examiner A examined a hunter and certified it sound. Six weeks later the purchaser alleged that the animal was a roarer, and called in examiner B, who not only certified that the animal was roarer, and consequently unsound, but added, no doubt at the instigation of the purchaser, that in his opinion the condition must have been present at the time of purchase. It is difficult to imagine on what this opinion was based, and, indeed, subsequent inquiries elicited that the horse had developed strangles a fortnight after it was bought. Such an opinion if given in court, and particularly in view of the subsequent revelation, must bring discredit on the veterinary profession.

In order to allay any possible uneasiness in the minds of readers who might have seen somewhat similar cases, it may be stated that the examples given are imaginary and do not relate to any actual cases.

2.—Poisoning. Where evidence is required concerning alleged damage due to poisoning, particular care is necessary. Even where symptoms seem to indicate the likelihood of poisoning it is difficult to say with certainty that a particular poison and that alone was the cause of death. Where a specific poison is suspected as a cause of death evidence will most probably be given by an analytical chemist, but even such clear supporting evidence should be critically examined. For example: Some cattle died on a farm, the owner says he suspects the linseed cake to be the cause. The veterinary surgeon, having no clear view as to the cause of death, agrees that it may be the cake, and a sample is sent for analysis. The report is positive, the analyst has found hydrocyanic acid in the sample. The possible reaction of the owner of the cattle is to proceed at once in law against the manufacturers of the cake. But if the veterinary surgeon is wise he will look ahead and consider how he will answer opposing counsel who may suggest that the cake in question has been made in quantity and used on perhaps a hundred other farms without any detriment. Further, that as the amount of the poison found by the analyst was .001 (or whatever it may be) what would the effect be on cattle receiving say 4 lb. of the cake per day? The veterinary surgeon might feel compelled to admit that the effect would be just nil. And lastly, if the symptoms shown by the cattle were not compatible with some entirely different condition?

It may be contended that this did not happen, and that in any case it did not come into court. But it might possibly happen and the veterinary surgeon might find himself unpleasantly involved in such a case against his own inclination.

Examples such as the foregoing, real or imaginary, might be given *ad infinitum*, but sufficient has been said to suggest that the veterinary surgeon when invited to give evidence may by careful attention to detail in his examination, and by developing a fair, disinterested, and judicial attitude in marshalling his evidence earn for himself, and for his profession as a whole, the respect of the community which is so much to be desired.

Abstracts

ABORTUS FEVER*

By D. G. LEYS, D.M., F.R.C.P.
Physician, Royal Northern Infirmary, Inverness; Consulting Physician to the Northern Counties

Brucella abortus infection in cattle is very common. No doubt a good farmer eradicates known cases from his herd, but I have been told that it is an accepted practice in dairy-farming districts to send infected animals to the sales. The danger of infection to man is from mastitis in the cow, when Brucella is conveyed in the milk or through an abrasion in the hand of a farm worker. The disease is not notifiable, and it is difficult to estimate its incidence; since its symptoms are often trivial, very variable, and never distinctive, diagnosis depends almost entirely on the agglutination test, and there seems little doubt that the true incidence is several times that of the recognised cases. Sub-clinical infection is probably very common. Huddleson (1939) refers to a study in school children which disclosed a significant agglutination titre in 40 per cent. after all had drunk infected milk, when only two of the children developed symptoms of the disease; agglutination titres in symptomless subjects rose as high as 1 : 12,000, and many had titres of 1 : 320. These children were observed over a period of more than a year, and the development of maximum agglutination was often a matter of months. Wilson (1942) estimates that 500 cases per annum occur in England and Wales.

Human cases of the disease were not recognised for many years after it was known that infection in cattle was common; mortality is low, and the disease does not appear to be a cause of abortion in women, for more than one case has been observed in an undisturbed pregnancy. The number of Brucella in infected cows' milk is far less than of *Br. melitensis* in goats' milk, and this may account for the relative mildness of abortus fever as compared with undulant fever. The two organisms can only be distinguished serologically, and the clinical course of the infection is very similar.

The general picture of the disease is that of an insidious onset (with uncertain but probably long incubation), a prolonged course of anything up to several months but usually some weeks, with limb pains and sweating as the prominent symptoms, an undulant type of fever, leucopenia, and negligible (possibly no essential) mortality. This is a true account of many cases, making a picture easily kept in mind, and if the blood of every patient presenting it were examined for *Br. abortus* agglutinins the great majority of cases would probably be diagnosed. One might perhaps question the need for laying stress on the importance of correctly diagnosing a disease which is essentially not fatal, which causes no lasting disability, and which is very possibly not amenable to any specific treatment. The importance is twofold: (1) the infection is a cause of a good deal of prolonged invalidism, but if there is no recognition of its prevalence there will be the less energetic search for a cure and for measures to eradicate it; (2) a

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true diagnosis will often serve greatly to relieve the mind of patient and doctor, and may prevent a long-continued enforced period of medical observation and inactivity for suspected tuberculosis. Abortus fever is a more likely diagnosis than tuberculosis in patients who have sweating as the presenting symptom.

Quite a high proportion of abortus fever cases, however, have bizarre symptoms, and these may present in such a way as to make diagnosis most difficult. Huddleson things that "latent" infection may become evident after some intercurrent, perhaps trivial, illness; on the other hand, in one of my cases the onset of the fever was the signal for the development of a streptococcal endocarditis. It seems worth while to give an account of eight cases which I saw between June, 1938, and June, 1942, because of the extraordinary diversity of their symptoms: so much is this diversity impressed upon one by even such a limited experience of the disease that the diagnosis is automatically considered in every case of fever unexplained after a few days. In the central laboratory of the area an agglutination for *Br. abortus* is included in every Widal reaction.

The endemic nature of the infection is shown by the time of onset of these eight cases from one area:—

1938	1939	1940	1941	1942
– 1 –	– – 1 1	1 – – 1	– 1 1 –	– 1 –

Only one case had direct contact with cows: the others were therefore all due to infected milk. The provisional diagnoses before the finding of positive agglutination were: typhoid (1), pyelitis (1), pulmonary tuberculosis (1), meningitis (2), bronchitis (1), neurosis (1), rheumatism (1), i.e., in no case was a correct diagnosis made immediately, and most of the patients had been ill for some weeks before the diagnosis was proved.

Case I: Typical Undulant Fever with Psychosis

A married woman, aged 49, with a lifelong history of psychosomatic symptoms. First seen January 3, 1942. Diagnosis of abortus fever on November 16, 1941, when agglutination titre was 1 : 1,600. History then about three weeks, and symptoms: constipation, rigors, sweating, limb pains, and exhaustion. Two attempts to give sustained treatment with a sulphonamide abandoned for lack of co-operation. Three undulations of fever.

Condition of patient in the eighth or ninth week of illness. Apathetic, querulous, and discontented. Complete insight into her condition. No lack of emotional control at this stage. Required trained nurse at home and made life difficult for the nurse. Attempted to supervise affairs of house and family. Physical condition good, but tongue dry; fairly heavy sweating, almost entirely at night. No pain on movement of limbs. No albuminuria and no physical signs found in nervous system; no enlargement of liver or spleen. Differential cell count on December 30, 1941: P. 66, L. 29, M. 3, B. 1, E. 0.5 per cent. Blood count on January 6, 1942: R.B.C. 4,170,000, Hb 77 per cent., C.I. 0.92, W.B.C. 6,150 (P. 58, L. 40, M. 2). She found it difficult to sleep, and had been given both bromide and barbiturate; a slight tendency to disorientation and to aphasia and to agraphia, which was evident as hesitation in the finding of words, was attributed at this time to the effects of the barbiturate.

She resisted admission to hospital until January 25, by which time both

her physical and her mental condition had deteriorated. She had lost weight and refused food. Her attitude to doctors and nurses was critical and resentful, but there was still complete insight and she was quite prepared to accept the fact that her depression and irritability were the result of her illness. The periods of depression did not correspond with periods of temperature. After admission she had an irregular pyrexia, one definite relapse of the undulant type from January 20 to 27, and thereafter no significant rise of temperature. A little later she developed lack of emotional control and strong paranoid tendencies.

On admission to the Royal Northern Infirmary (January 25) agglutination to *Br. abortus* was 1 : 16,000. An estimate of blood bromide was made on the suspicion that her depression might be due to bromide poisoning, and was 250 mg./100 c.cm. Complete withdrawal of bromide, however, made no impression on the emotional state. There was intermittent albuminuria and the urine sometimes showed pus cells. Her blood culture on January 22 was sterile. The blood count showed a deterioration, and on March 3 was: R.B.C. 2,880,000, Hb 59 per cent., C.I. 1.

Comment. The symptoms in this patient were essentially psychotic, and consisted of depression, apathy, lack of emotional control, slight tendency to aphasia and agraphia, irritability, and suspicion. Throughout there was complete insight into her state. This case can hardly be regarded as a chronic one, because five months after the onset she was restored to her usual health. It is notable that the agglutination increased from 1 : 1,600 to 1 : 16,000 between the third and eighth weeks of the illness. There was no notable leucopenia. Sulphonamides were not used effectively because of lack of co-operation, but short trials of 6 g. daily of (*a*) sulphanilamide, (*b*) sulphapyridine, and (*c*) sulphathiazole had no influence on the temperature.

Case II : Bronchitis with Steatorrhœa : ? Pancreatitis : Intermittent Albuminuria

A rigger in the R.A.F. aged 37. History of recurrent bronchitis for ten years. Was admitted to a military hospital on February 13, 1940, with cough and sweating, present for some weeks. The onset of this attack was described as influenza. Transferred to Royal Northern Infirmary February 22. Febrile; signs of bronchitis. Treatment with sulphapyridine begun, but discontinued because of persistent nausea and subsidence of temperature. Inconstant albuminuria; centrifuged urine contained red cells. Blood urea, 39 mg./100 c.cm. Standard urea clearance, 118 per cent. of normal. Blood culture sterile. From the first he complained of tenderness in the epigastrium and abdominal pain, and showed muscle spasm. Profuse sweats. Hb 75 per cent., W.B.C. 13,000 (P. 69, L. 29, M. 2). Agglutination for *Br. abortus* positive 1 : 8,000. Stools rather frequent, very pale. Total fæcal fat, March 4, 44 g. per cent. (60 per cent. split, 40 per cent. unsplit). Urinary diastase 50 units per c.cm., and total urinary diastase 62,500 units in 24 hours. March 18: total fæcal fat 50.3 g. per cent. (63.1 per cent. split, 36.9 per cent. unsplit). Serum bilirubin 0.4 mg./100 c.cm. By March 11 his symptoms had disappeared except for slight stiffness in the joints and for the signs of bronchitis.

Case III: Meningism, Pyuria, and Urticaria

A schoolgirl aged 11. Onset November 1, 1940, with vertigo and stiff neck. Seen three days later by family doctor, who found nuchal rigidity. T. 101.8 deg. F., P. 130. Spinal fluid normal. Given 6 g. of sulphanilamide daily for ? three days. Seen then by medical specialist, who found slight cyanosis, dilated pupils, diminished tendon jerks, resistance to palaption of abdomen, furred tongue, and an urticarial rash. Urine showed pus cells, and diagnosis of pyelitis was made. Symptoms, however, continued. On November 25 Widal reaction, because of continued temperature: agglutination to *Br. abortus* 1 : 480, negative to typhoid group. Blood culture sterile. Blood counts: November 6, R.B.C. 5,100,000, Hb. 83; C.I. 0.82, W.B.C. 3,500 (P. 43.5, L. 36.5, M. 19.5, B. 0.5); and on November 7, W.B.C. 6,500 (P. 69, L. 20, M. 9.5, B. 0.5).

I saw her on November 25: temperature still raised; sweating not excessive; pain in the back and hands and feet. No physical signs. Sulphanilamide 6 g. a day was given again, and was discontinued after two or three days: complete subsidence of symptoms, which did not recur.

Case IV: Bacterial Endocarditis

A hotel maid aged 19. Rheumatism at 13; established mitral disease. Seen in hotel July 31, 1939, twelve days after onset of an acute illness with delirium. No headache; no pains in limbs; no dysuria; no diarrhœa; no vomiting. Examination: Flushed; furred tongue; erythematous rash very suggestive of typhoid (about twenty small erythematous spots on trunk and limbs). Agglutination to the typhoid group negative, but positive to *Br. abortus* 1 : 3,000. She was admitted to the fever hospital; on admission, R.B.C. 3,970,000, Hb 68, C.I. 0.85, W.B.C. 7,350. No albuminuria. She was given sulphapyridine 6 g. daily, with short intermissions, for a period of five weeks. Temperature showed rises at irregular intervals of a few days and usually persisted twenty-four hours; occasionally febrile periods would last three days. Temperature never reached a higher level than 101 deg. F. The temperature chart suggested a recrudescence of temperature whenever sulphapyridine was stopped. Erythematous rash reappeared on October 5.

Transferred to Royal Northern Infirmary in November 6, 1939: R.B.C. 2,360,000, Hb. 34, C.I. 0.72, W.B.C. 14,150 (P. 77, L. 18, E.1, M.3.5). Platelets 123,610 per c.mm. Reticulocytes 2.5 per cent. Blood film showed anisocytosis, poikilocytosis, and polychromasia. Examination: Very pale; furred tongue; tachycardia; B.P. 140/70; albuminuria—centrifuged deposit of urine showed red cells. Blood urea 135 mg./100 c.cm. No embolic phenomena apart from the kidneys. Agglutination to *Br. abortus* 1 : 120. Blood culture: *Str. viridans*. Further attempts were made to treat this patient with sulphapyridine and heparin, but she shortly afterwards died of uræmia. No necropsy was allowed.

Case V: Typical Mild Case with Sweating and Limb Pains

A labourer aged 20. Seen at Royal North Infirmary as out-patient on April 15, 1941. He had been off work four weeks with "influenza." The symptoms were of limb pains, headache, and sweating. The sweats occurred about midnight, and he was referred to hospital because of the sweating. During

the daytime he had no symptoms. Had not lost weight. Examination: A thin, nervous man with acne. No physical signs found. Sweats thought to be emotional, but blood sedimentation rate 7 mm. (Westergren), and agglutination to *Br. abortus* positive 1 : 8,000.

Case VI: Mild case; Onset with Rigors

A bank clerk aged 25. Diagnosis here less certain than for the others. Admitted to Royal Northern Infirmary two weeks after onset of illness with slight rigor. An old case of pulmonary tuberculosis with maintained pneumothorax: last refill the day after onset of symptoms. Temperature raised from beginning of symptoms, and a week later pain in limbs and joints and headache, but no joint effusions. R.B.C. 4,350,000, Hb 73, C.I. 0.81, W.B.C. 7,950 (P. 76, L. 21, M. 3). Agglutination to *Br. abortus* negative on July 14, 1941; agglutination positive 1 : 120 on July 21, and positive 1 : 60 on July 27. B.S.R. on July 19, 21 mm. (Westergren). Blood culture sterile; stool culture negative. Treated with sulphathiazole, 1 g. six-hourly; immediate subsidence of temperature and symptoms.

Case VII: Pleural Pain, Dyspnœa, and Tonsillitis

A soldier aged 44. Sent to hospital October 3, 1939, as suspected case of pulmonary tuberculosis. Easily tired, breathless on exertion; nocturnal cough, pleural pain, sweating; sore throat one week before admission; no gastro-intestinal symptoms; no limb pains. Examination: Not severely ill; signs of bronchitis; no rash; sputum, no T.B.; B.S.R. 3 mm.; W.R. negative; W.B.C. 14,250 (P. 61.5, L. 30.5, M. 7). Agglutination to *Br. abortus* positive 1 : 4,000. Treatment with sulphanilamide without any spectacular result, and symptoms still present on November 19, 1939.

Case VIII: Meningism and Ocular Palsy

A farm servant aged 15. Admitted to hospital July 30, 1938, three weeks after onset of illness, with rigor, sweating, and exhaustion. Seen by doctor, but no diagnosis made. Improved. Returned to work for one week, when symptoms recurred with severe sweating and frontal headache. Intermittent diplopia from onset. Examination July 30: Flushed, sweating, dilated active pupils, normal fundi, slight nuchal spasm, and positive Kernig's sign. Left sixth nerve palsy. Spinal fluid twice examined; completely normal. Remained febrile for three weeks; symptoms and signs then gradually subsided. Sixth nerve weakness observed intermittently. No albuminuria. Agglutination to *Br. abortus* positive 1 : 16,000 on August 6, and positive 1 : 960 on August 17. W.B.C. 6,350 (P. 55, L. 21, M. 20, E.4). W. R. negative. Blood culture sterile on August 12.

Comments

1. In none of these cases was enlargement of liver and spleen noted.
2. Anæmia was not a feature apart from intercurrent or pre-existing disease, nor did any case show an important loss of weight.
3. *Leucocytes.*—A considerable diminution in the polymorph count and in the monocyte count, without any proportionate increase in the lymphocytes,

is considered characteristic of *Br. abortus*. Only one of these patients, however, showed any material reduction in the polymorphs (Case III; total polymorphs 1,505), but the next day this child's polymorph count had increased to 4,485. The monocyte count was certainly rather low in several cases, the lowest figure found being 122. One case (No. VIII) had a total monocyte count of 1,260, which is a high figure—so high, in fact, that mononucleosis was considered as a possible diagnosis, as also in Case III, in which the monocyte count was at one time 19.5 per cent. The leucocyte counts are set out in the following table:—

Leucocyte Counts

Case	Age	Total	P. (per cent.)	L. (per cent.)	M. (per cent.)	E. (per cent.)	B. (per cent.)
I	49	6,150	58	40	2	—	—
II	37	13,000	69	29	2	—	—
III	11	3,500	43.5	36.5	19.5	—	0.5
		6,500	69	20	9.5	—	0.5
IV	19	7,350	—	—	—	—	—
V	20	—	—	—	—	—	—
VI	25	7,950	76	21	3	—	—
		10,700	65	32	3	—	—
VII	44	14,250	61.5	30.5	7	—	—
VIII	15	6,350	55	21	20	4	—

4. Blood cultures in six cases at various times, and several during the acute phase, were all sterile.

5. Blood sedimentation rate was estimated only three times. It was 7 mm. in Case V, 21 mm. in Case VI, 3 mm. in Case VII (Westergren one hour). One might perhaps suggest that high rates are not found because of the absence of any massive inflammatory exudate.

6. *Skin Eruptions.*—Only two cases showed rashes which were considered to be due to the disease. Case III had an urticarial type of eruption, and Case IV in the early stages an eruption indistinguishable from typhoid, which was the original clinical diagnosis. According to Huddleson a typhoid-like eruption is frequent.

7. *Agglutination.*—Agglutination titres with the corresponding period of the disease are given below:

Agglutination Titres

Case I: At 3 weeks, 1 : 1,600; at 12 weeks, 1 : 16,000.
„ II: At 7 weeks, 1 : 8,000.
„ III: At 4 weeks, 1 : 480.
„ IV: At 2 weeks, 1 : 3,000; at 5 months, 1 : 120.
„ V: At 4 weeks, 1 : 8,000.
„ VI: At 1 week, nil; at 2 weeks, 1 : 120; at 3 weeks, 1 : 60.
„ VII: At 4 weeks, 1 : 4,000.
„ VIII: At 4 weeks, 1 : 16,000; at 6 weeks, 1 : 960.

It seems to be agreed that agglutination does not become positive until the second week, probably not until the tenth day from the onset of symptoms, and Huddleson says it may be negative right throughout a chronic case. The minimum diagnostic titre is a little difficult to determine. It will be noted from the above figures that there was no case with a titre less than 1 : 480, except Case VI, in which diagnosis, apart from the symptomatology, rested upon an increase in the agglutination titre from 0 to 120 during the first two weeks of illness; at the end of the third week it was found to be 1 : 60. It so happens that this was the only case in which a rather strong impression of the influence of sulphonamide

treatment was gained. Harries and Mitman (1940) gave 1 : 100 as the critical level, but consider that in London, where use of pasteurised milk is general and sub-clinical infections are less common, a titre of 1 : 80 is suspicious. This figure is also given by Wilson (1942) as significant. Huddleson gives 1 : 50 as the level for a presumptive diagnosis. Huddleson uses in diagnosis a skin-sensitivity test made from the products of a broth culture in a form which he calls "brucellergen," but the agglutination test seems to provide all that is required for a positive diagnosis.

8. *Unusual Symptoms.*—Meningism is reported by Huddleson as common in Malta. I have found no previous reference to it in abortus fever, nor any reference to ocular palsy. Cases of bacterial endocarditis are reported by Spink and Nelson (1939), who discuss the difficulties of diagnosis, and by Scott and Saphir (1928).

9. *Treatment.*—There is scanty evidence of any positive effects from the use of any special line of treatment. Huddleson claims a shortening of the infective period by the use of a vaccine. An antimony compound, stibophen (traded as "fouadin"), which is used in schistosomiasis, has been claimed as effective, but the positive evidence is slight (Neumann, 1936). An attempt was made to use this drug in one protracted case, but the appearance of albuminuria after the first dose prevented any further administration. There have been no dramatic or even very encouraging results reported with any of the sulphonamide compounds. All except one of the eight patients here reported were given a sulphonamide, but without any obvious effect. Sulphapyridine was used in two patients, suphanilamide in four, and sulphathiazole in one. In Case VI there was an abrupt termination of symptoms after the use of sulphathiazole; such a mild case, however, is clearly not enough to warrant any definite conclusion.

Summary

A description is given of eight cases of abortus fever, which is endemic in this country. The disease is benign, but gives rise to great difficulties in clinical diagnosis, and it may be the starting-point of more serious disease. Since milk is almost entirely the source of infection, universal pasteurisation would eradicate it. The agglutination test is conclusive in diagnosis.

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STILBŒSTROL DIPROPIONATE FOR THE REMOVAL OF A MUMMIFIED FŒTUS

By CHARLES WEIGHTON, M.R.C.V.S.,
Lincoln

SUBJECT: A Friesian cow, 2nd or 3rd calver.

On January 17, 1941, the cow was delivered of dead twin calves without much difficulty. Two acriflavine pessaries were inserted. Four days later the

uterus was irrigated and two pessaries inserted. The condition of the uterus suggested that there might be difficulty in again getting the cow in calf. When visiting the farm on January 14, 1942, I made inquiries about the cow and was informed that she was in calf. After discussing with the herdsman my interest in the case, he agreed to my examining the cow to confirm, as he expected, pregnancy. The uterus revealed the presence of a mummified fœtus, the bones being easily felt from the rectum. The cervical canal was dilated to a little more than the diameter of a lead pencil. Only a little thin discharge was draining into the vagina and was causing a slight visible contamination of the vulva. A corpus luteum was present in the left ovary. The cow was in good condition and showed no sign of illness. On February 20, 20 mgm. of stilbœstrol dipropionate was given, followed by a second injection of 15 mgm. next day. Twenty-four hours after the first injection the cervical canal had dilated to about three times the original diameter, and 48 hours afterwards (February 22, 1942) three fingers could be inserted, and eventually the hand sufficiently far to permit, with the aid of forceps, the complete removal of the remains of the fœtus, which consisted of bones only, covered with a yellow-brown fluid. The whole operation took 1¼ hours and was carried out by Mr. D. V. Balls, M.R.C.V.S. The fœtus had died at about the fifth month of pregnancy.

The cow made a good recovery, but no further attempt was made to breed from her.

Correspondence

To the Editor, THE VETERINARY JOURNAL.

A New Policy For Veterinary Science

SIR,—The article by Sir Albert Howard in your March issue makes most interesting reading, irrespective of whether one is in complete agreement or not. The author is confident that he has discovered the proper method to control diseases of animals. The writer, like Sir Albert Howard, is a farmer, and has spent many years in or near some of the places he mentions abroad, yet my experience does not concur entirely with his theory regarding some of the diseases mentioned.

In a South American Republic where for many years the diseases of animals came under my jurisdiction, the country was kept free of foot-and-mouth disease, not by the methods mentioned by Sir Albert, because Mother Earth had to yield crops, principally sugar cane and maize, irrespective of humus and artificials, until the yield became too low to defray the expenses, when such areas were converted into pasture land.

Let us take another Republic on the Pacific coast of South America, where the land is so fertile that sugar cane once planted yields perpetually, the cane frequently measuring thirty feet in height, and it is sufficient to cut down and burn the brush and scratch the soil and sow with different seeds to recover returns of a hundred to one. Yet foot-and-mouth disease is prevalent in this ideally fertile country.

In the U.S.A. where farming in some of the States has been so mechanically and artificially engineered that the crop yields are often alarmingly low, yet this vast country has been kept free of foot-and-mouth disease for years, and very soon we expect that tuberculosis in cattle will be non-existent there.

As we had to work in close collaboration with the Bureau of Animal Industry, on account of international trade, I am in a position to state that both countries achieved the same object, viz., freedom of foot-and-mouth disease, but by methods different and quite distinct from those suggested by Sir Albert Howard. Moreover, having stood the test of years, they should be adopted by this country as soon as the war is over.

As foot-and-mouth disease is prevalent on the Continent of Europe, and it is intended to replenish their herds, it would be a grand opportunity to carry out field trials, when healthy cattle are imported there, on the lines suggested by Sir Albert Howard.

Yours faithfully,
EDWARD MORGAN.

Hayes,
Kent.
March 30, 1943.

Review

Jeyes' Animal Book: 70 pp., 8 illus.; **Jeyes' Poultry Book:** 40 pp., 4 illus. JEYES' SANITARY COMPOUNDS Co., Millbrook, Chigwell, Essex. Price gratis.

BOOKLETS issued to the general public by manufacturers in order to advertise their products are all too familiar.

Those dealing with health and disease in animals are, only too rightly, regarded with scepticism by the veterinarian.

Jeyes' Animal and Poultry Books, however, are in a somewhat different sphere to the great majority, since hygiene and disinfection in the control of disease are the themes of both booklets. As stated in the prefaces, they are issued to stress the vital need for the application of hygienic principles in the prevention of disease.

Numbered sections are devoted in the main to some of the infectious and parasitic diseases of animals and poultry.

In the Animal Book due prominence is given to the veterinary surgeon, the introduction stating "that the terms veterinary surgeon, veterinarian or 'vet' are legally restricted to registered members or fellows of the Royal College of Veterinary Surgeons, who have undergone a long period of training similar to that required of qualified medical men, and who are permitted to use the letters M.R.C.V.S. or F.R.C.V.S. after their names."

A prominent section in the Animal Book is devoted to a comprehensive account of the N.V.M.A. Survey Committee's scheme for the control of certain diseases of dairy cattle, whilst in both the Animal and Poultry Books sections deal with the stock-owner's obligations with regard to notifiable diseases.

Although less prominence is given in the Poultry Book to veterinary surgeons, care is taken to stress the need for accurate diagnosis and the statement that "many veterinary surgeons are now willing to assist poultry farmers with advice on problems associated with disease in birds and, by availing themselves of the services of such a veterinary surgeon, the poultry keeper may prevent considerable loss," is by no means ungenerous to the profession.

Both books are very well indexed and are attractively bound and printed in clear type on exceptionally good paper and must be regarded as "classics" in advertising matter.

The veterinary reader will find them of interest and of some use perhaps with regard to the concise advice on precautions which should be adopted in many of the infectious diseases.

To those veterinary surgeons who have not made a study of poultry diseases, the Poultry Book will undoubtedly form a convenient means of primary reference to many subjects concerning poultry.

Our attention has been drawn to the article "Therapeutic Control of Lactation," by Louis A. Klein, published in the *University of Pennsylvania Bulletin*, Vol. XLIII, 1942-43, and abstracted in the *Veterinary Journal*, 1943, Vol. 99, pp. 56-58. The article is a review of investigations on the subject, the author acknowledging the references from which he obtained the material for his review. In order that there will be no misunderstanding on the part of our readers we append a list of references given by the author.

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